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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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WELLS ST. JOHN P.S.
601 W. FIRST AVENUE, SUITE 1300
SPOKANE, WA 99201

EXAMINER	
HARAN, JOHN T	
ART UNIT	PAPER NUMBER
1733	

DATE MAILED: 10/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/480,076

Applicant(s)

LAKE, RICKIE C.

Examiner

John T. Haran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 9,10,12,23-28 and 51-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9,10,12,23-28 and 51-59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 January 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 22.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/27/03 has been entered.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 8/27/03 has been considered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 9, 10, 11, 14, 51, 52, 55, and 56 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The step of "providing a curable adhesive composition comprising only three components, the three components comprising a silane, a conductive filler and

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hardener; the silane comprising an epoxy terminated silane comprising a glycidoxymethoxy silane" in claim 9 constitutes new matter. The specification indicates that it is preferred that the curable adhesive composition **comprises** a two-part epoxy resin and hardener system (page 5, lines 16-19) and also has an epoxy-terminated silane, such as glycidoxypropyltrimethoxysilane in an amount less than or equal to about 2% by weight (page 5, lines 19-24). The specification then cites an example of the above mentioned preferred adhesive composition that is formed by mixing a specific silane, a specific silver epoxy resin (resin filled with conductive filler), and a specific hardener (page 6, lines 1-12). It is noted that the specification mentions the preferred curable adhesive composition **comprises** (page 5, lines 16-17) the listed components which is open language and does not impose any restrictions on the makeup of the composition. There is no language indicating that the composition consists of or is restricted to only being hardener, silane, and conductive filler. Furthermore the disclosure would not convey to one skilled in the art that Applicant had possession of or the intent of excluding the adhesive composition from including anything other than silane, conductive filler, and hardener at the time the application was filed.

In addition it appears that Applicant actually teaches the composition has at least four components rather than three. The disclosure teaches a silane, an epoxy with conductive filler (2 components), and a hardener (page 6, lines 1-12). One skilled in the art reading the disclosure as a whole would consider the epoxy and the silane to be two separate components and that therefore the adhesive composition comprises at least 4 components rather than three. One skilled in the art reading the specification as a

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whole would not have appreciated that Applicant had possession of an adhesive composition comprising only silane, conductive filler, and hardener at the time the application was filed.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 9, 10, 11, 14, 51, 52, 55, and 56 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 9 the phrase "comprising only three components" renders the claim indefinite because transitions phrases are supposed to convey the scope of the claim and the wording "comprising only" is confusing (See MPEP 2111.03). Comprising is considered open language and unrestrictive, however the word "only" implies closed language and is restrictive and the phrasing "comprising only" renders the claim unclear because the scope of the claim is uncertain. It appears that Applicant intends to use closed language which is better accomplished by using appropriate closed language, such as - - consisting - -. However, as noted above, such closed language is considered to be new matter.

Claim 9 is also indefinite because it is unclear where the distinction is made between when something is a component or a subcomponent. The terminology used in the claim is confusing. The manner in which the composition is described in the claim is confusing because it has the silane comprising a silane. It appears that the preferred

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adhesive composition taught in the specification (page 6, lines 1-12) can be described in two ways. The first way is a composition of at least four components comprising a silane, an epoxy, a conductive filler, and a hardener. The second way is a composition of at least three components comprising an epoxy terminated silane, a conductive filler, and a hardener. These descriptions are based upon Examiner's understanding of the example cited on page 6 that the epoxy terminated silane is formed by mixing the Z-6040 silane with the CMI 116-37A silver epoxy resin. It is suggested to amend the claim to list the components in accordance with either of the suggestions

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 23-27 and 57-59 are rejected under 35 U.S.C. 103(a) as obvious over Chen et al (U.S. Patent 4,975,221) in view of Canning et al (U.S. Patent 5,783,465).

Chen et al disclose a curable epoxy adhesive for use in attaching electrical components together, such as semiconductor die or chips to a substrate, to form an electrical connection wherein the epoxy adhesive contains an electrically conductive filler and an epoxy functional silane adhesion promotor (Column 1, lines 5-11 and Column 3, line 59 to Column 4, line 5).

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While Chen et al is silent towards the specifics of using the adhesive to electrically interconnect electrical components, it would have been obvious to one of ordinary skill in the art at the time the invention was made that in order to form an electrical connection between two electrical components with an adhesive, the adhesive must be interposed between the components and cured. Furthermore, such is well known and conventional in the art, as shown for example in Canning et al (See Figure 2). Additionally one skilled in the art also would have readily appreciated that it is notoriously well known and conventional when electrically connecting a semiconductor chip to a substrate that both the chip and the substrate have metal contact sites and when bonded with an adhesive, the adhesive contacts the metal contact sites, as shown for example in Canning et al (See Figure 2, Column 3, lines 10-35). It would have been obvious to one of ordinary skill in the art at the time the invention was made to electrically connect the semiconductor chip to the substrate by placing the conductive epoxy between the chip and substrate such that it contacts the metal contacts of the chip and substrate and then cure the adhesive in the method of Chen et al, as is conventional in the art as evidenced for example by Canning et al.

Applicant teaches the contact resistance of an epoxy adhesive without an epoxy terminated silane is too high and unacceptable. Applicant also teaches that the concentration of silane in an epoxy terminated silane lowers the resistance of the adhesive and thereby lowers the contact resistance through a metal surface (Specification, page 6, line 15 to page 7 line 10). While Chen is silent towards the epoxy having an effective metal surface wetting concentration of silane that results in a

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contact resistance through the metal surface of less than or equal to about .032 ohm-cm², Chen et al disclose the composition of the epoxy adhesive listing each component in terms of part by weight (See Column 4, lines 15-21). Applicant teaches that the effective concentration of the silane needed to obtain the desired contact resistances is less than 2% by weight or 1% by weight (Specification, page 5, lines 21-24; page 7, lines 5-10). It is clear from the composition listing in Chen et al that the adhesion promoter (epoxy functional silane) comprises less than 2% by weight or 1% by weight. One skilled in the art would have readily appreciated that Applicant teaches that the determining factor of obtaining the desired contact resistance is the concentration of the silane and the concentration of silane taught in the adhesive of Chen et al is within the effective concentration range taught by Applicant and that therefore it would be expected for the adhesive of Chen et al to have a contact resistance of the desired values (i.e. less than .3, .16, or .032 ohm-cm²).

It would have been obvious to interpose the epoxy adhesive having the disclosed composition between a semiconductor chip and a substrate, both having metal contact sites, and to then cure the adhesive into an electrically conductive bond electrically interconnecting the chip and substrate via the metal contact sites wherein the concentration of silane in the epoxy results in a contact resistance through the metal contact sites of the desired values in the method of Chen et al.

Regarding claims 57-59, it is well known and conventional for epoxy to be made conductive by adding silver to it and to add a hardener or curing agent, as shown for example in Chen et al and one skilled in the art would have readily appreciated it would

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have been within the purview of one skilled in the art to determine the necessary amount of adhesion promoter to add to a silver epoxy to ensure adequate adhesion and the necessary amount of hardener (curing agent) to ensure adequate curing of the epoxy. It would have been obvious to combine the epoxy, hardener, and silane in the claimed proportions.

9. Claims 28 and 53-54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (U.S. Patent 4,975,221) in view of Canning et al (U.S. Patent 5,783,465) as applied to claims 23-27 above, and further in view of Tuttle (U.S. Patent 5,558,679).

Regarding claim 28, one skilled in the art would have readily appreciated that it is well known and conventional to electrically interconnect electronic components via an epoxy adhesive wherein one of the electronic components has a surface with metal containing nickel, as shown for example in Tuttle (Column 3, lines 60-61) and that Chen et al is a general teaching for interconnecting electronic parts. It would have been obvious to one of ordinary skill in the art at the time the invention was made to connect an electrical component with a nickel containing metal surface to another electrical component in the method of Chen et al, as modified above, as suggested in Tuttle.

Regarding claims 53-54, one skilled in the art would have readily appreciated that Chen et al is a general teaching for interconnecting electronic parts and that it is well known and conventional in the art to electrically interconnect two electronic components that each has a node that comprises an interface for electrically interconnecting the two components and for the adhesive to contact the interfaces, as

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shown for example in Tuttle (Column 2, line 63 to Column 3, line 29). It would have been obvious to one of ordinary skill in the art at the time the invention was made to electrically interconnect two electronic components, each having a node that comprises an interface, wherein the adhesive contacts the nodes in the method of Chen et al.

Response to Arguments

10. Applicant's arguments filed 8/27/03 have been fully considered but they are not persuasive.

Regarding claim 9, as noted above, claim 9 is not allowable because it contains new matter and confusing terminology.

Regarding claim 23, Applicant's specification teaches that the determining factor of getting the desired contact resistance depends upon the concentration of the silane. Applicant and Chen both teach conductive epoxy with a silane and both teach the same amount of silane in the adhesive composition. Chen et al teaches having an epoxy functional silane adhesion promotor in an amount less than 2% by weight. Applicant discloses that the desired contact resistances are achieved by using a silane in an amount less than 2% by weight. Both Chen et al and Applicant teach having a silane concentration of less than 2% by weight. One skilled in the art would have readily appreciated that only the expected results would be achieved in Chen et al, i.e. the desired contact resistance, from using the same concentration of silane as Applicant. Applicant teaches that the concentration of silane is the determining factor of the contact resistance and there is no indication that the presence or absence of other

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typical components of a conductive epoxy would substantially alter the contact resistance. Furthermore as noted above Applicant's preferred example of the adhesive composition is not limited to having only silane, hardener, and conductive filler so Applicant's arguments that Chen et al teach additional components is not found to be persuasive.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John T. Haran** whose telephone number is **(703) 305-0052**. The examiner can normally be reached on M-Th (8 - 5) and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (703) 308-3853. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


John T. Haran
Examiner
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